

## Curve Sketching

p. 278 - 286 (4.3)

# 49

1. Find domain & range
2. Find x/y intercepts and Vert/Horz asymptotes
3. Find critical points and intervals where increasing & decreasing
4. Determine local max/min points
5. Determine concavity and find points of inflection
6. Sketch in the curve

1977 AB2 Consider the function  $f$  defined by  $f(x) = (x^2 - 1)^3$ .

a) For what values of  $x$  is  $f$  increasing?  $f'(x) = 3(x^2 - 1)^2(2x) = 0$   
 $f$  is incr. on  $(0, 1)$  and  $(1, \infty)$

$$\begin{array}{ccccccc}
 & & X=0 & & X=\pm 1 & & \\
 f' & - & & - & + & + & \\
 f & - & 0 & & 1 & & 
 \end{array}$$

$$f(0) = -1$$

b) Find the  $x$  and  $y$  coordinates of the rel. max and rel. min. Justify.

rel. min @  $f = -1$  @  $X=0$  since  $f'$  changed from neg. to pos. there

no rel. max since  $f'$  never changed from  $(+)$  to  $(-)$

c) For what values of  $x$  is the graph of  $f$  concave up?  $f'(x) = 6x(x^2 - 1)^2$

$$f''(x) = \cancel{6x(2)(x^2-1)(2x)} = 6x(2)(x^2-1)(2x) + (x^2-1)^2(6) = 0$$

$$\begin{array}{ccccccc}
 f'' & + & - & + & - & + & \\
 f & \cup & \cap & \cup & \cap & \cup & 
 \end{array}$$

$$6(x^2 - 1)[4x^2 + x^2 - 1] = 0$$

$$6(x^2 - 1)[5x^2 - 1] = 0$$

POI:  $x = \pm 1, \pm \sqrt{1/5}$

d) Sketch the graph of  $f$ .

$$\begin{array}{l}
 f(1) = 0 \\
 f(-1) = 0
 \end{array}$$



POI:  $x = \pm 1, \pm \sqrt{1/5}$